4 - Threads

21S1

Q4: What are the advantages of using multiple threads over multiple processes? Explain the difference between a worker pool thread model and a thread-per-object model, including details concerning what concurrency control and queueing is required in each case.

Threads require much fewer resources than processes and are quick to create. Multiple processes require a huge amount of time and resources to create.

Threads have a shared memory while processes require OS to allocate address space, memory, file and IO.

- Worker pool thread model P34
    - The thread-pool paradigm creates a fixed or dynamically resizable set of threads that either take incoming socket connection requests from a process maintained queue, or, if the accept socket API is thread safe then the pool of threads can take directly from the OS queue.
    - Need concurrency control to accept socket requests. Constraint by number of worker threads.
    - Worker threads are maintained in a queue. Once a thread finished its task, it will be pushed to the queue to wait for new tasks.
- Thread-per-object model P37
    - The thread-per-object paradigm creates a thread for each data object. This can potentially reduce cache miss rates in the machine since for a given data object, only 1 thread ever accesses it and it will reside only in the cache for that thread. This can greatly increase cache efficiency which can significantly improve overall performance of the machine.
    - Concurrency control is not needed.
    - Data objects are maintained in queues.

Q12.3: In Java Threads, which of the following methods execute threads without blocking?

- Thread.run() ✔
- Thread.join()
- Thread.start()
- Thread.interrupt()

Q12.6 Which of the following is not true?

- A new thread is spawned via the start method of class Thread.
- Two threads can simultaneously execute a synchronized non-static method of different instances of the same Java class.
- Two threads can simultaneously execute a synchronized non-static method of the same instance of the same Java class. ✔
- The sleep method of the class Thread is static and it puts the "current" thread to sleep.